Earth Science

Rockhounds' NATIONAL Magazine

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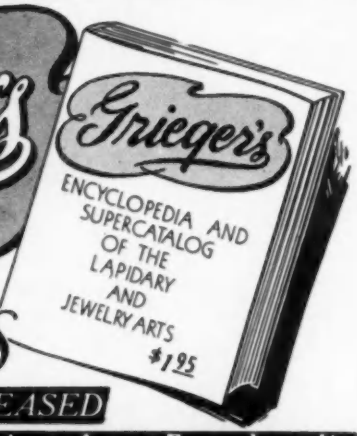

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Earth Science

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Vol. 10, No. 3

Official Publication of the Midwest Federation of Mineralogical Societies

EDITOR'S MEMO PAD

HOW often have we heard that trite old expression, "A rolling stone gathers no moss"! However true this may be, we should like to add, but it may and frequently does take on a beautiful polish.

Who of us has not found some ugly, unattractive chunk of rock which has lain for centuries or perhaps even millions of years in some talus slope at the foot of a cliff or a mountain, and then later on perhaps found a pebble of the same identical material in some far distant stream, or on an ocean beach, which has acquired naturally a most beautiful polish, making it sufficiently attractive to grace the cabinets of even the finest collections.

What then is the difference, you may ask? Same stone, same material, same age—one unattractive, even ugly, and the other most attractive indeed. There is only one explanation we might give for this phenomenon, and that is, while one has laid dormant and protected, the other has traveled far, being knocked about, bumping up against other similiar stones many thousands of times, first having its own rough corners worn off, and then its surface smoothed and finally polished by its many contacts with other pebbles which have moved along with it on its journeys. They, too, it must be remembered, may have been equally uncouth in appearance to start with, but through their many contacts acquired a high polish.

The moral is, while this certain pebble was itself being rounded out, it was at the same time aiding in the polishing of others similar to it, both acquiring beautification simultaneously.

Now that we have so boldly stated our premise, let us make our deductions and applications.

How often have we seen folks come into our clubs, who at first knew little, or perhaps were wholly ignorant concerning minerals and the earth sciences generally, and how often in a few years we have seen them grow and develop, acquiring self-confidence and knowledge, to a point where they were able to write or even lecture very intelligently upon almost any phase of the subject. This knowledge and art were acquired solely as the result of the encouragement they received in coming in contact with others of like interest. Had they become discouraged and remained at home they would have advanced but little.

Now may we carry our conclusions and admonitions just one step further. The season for vacations, travel and conventions is just ahead of us. Are you one of those who are going to roll out the old car, fill up the gas-tank, and take off for your convention headquarters, where you may come in contact and visit with many other rockhounds from distant places? If you are, through these contacts you will learn many interesting and valuable things, and as the saying goes, take on some polish. Or are you taking the easier course, just staying at home, being content to hear others tell of their wonderful experiences when they return from their trip to the convention?

Our advice is for all of you readers to develop a good case of rockhounditus, shake off that old inertia, or lethargy, as the case may be, and get going. If your convention and vacation dates do not jibe, take a vacation trip later, and do some collecting and visiting with fellow rockhounds wherever you may find them, on your own. When you return home you will have something to think and tell your friends about, and we will gamble that you will almost

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immediately start making plans for a similar trip next year.

Pardon, just one more word of advice. Be sure to get out your American Federation car emblem and put it on your car, and your lapel button or pin and wear it on your person. By so doing you may make just one contact with a fellow rockhound that will be of immeasurable value to you. These may be had from your club treasurer for the very modest sum of 50c, which is actually less than cost. We are seeing more and more of them in evidence every year. Why not get on the band wagon and get yours now.

* * *

PERSONS & EVENTS

It is seldom that one has the privilege of making an announcement which gives as much pleasure as we have in reporting the engagement of our club editor, Miss Bernice L. Wienrank, of Chicago, to Mr. Elmer E. Rexin, of Milwaukee, Wis.

MISS BERNICE L. WIENRANK

Miss Wienrank, who is an industrial nurse at the Kraft Foods plant in Chicago, was a World War II nurse and served her country well in the battles of Europe. She has been very active in Midwest Federation affairs, having been its efficient secretary since 1953. She is also a skilled lapidary, having turned out some very creditable work.

Mr. Rexin has been plant engineer at the Nunn Bush Shoe Co., in Milwaukee, for the past 23 years, and has gained wide recognition as the inventor of a hydraulic seismograph, which records earthquakes in a 400 feet artesian well located at the shoe factory where he works, and which is far more sensitive than the conventional type of seismograph.

Their courtship started when they met in January at a meeting of the Chicago Rocks and Minerals Society, where Mr. Rexin lectured on the subject dear to his heart, the hydraulic seismograph. Their wedding will take place early in June in the St. Peter's Lutheran Church at Crescent City, Ill., and they will spend their honeymoon hunting for petrified wood, agate and other gem materials in the vicinity of Phoenix, Ariz. They will reside in Milwaukee, and as Mrs. Rexin, Bernice will continue on the staff of EARTH SCIENCE, and also as secretary of the Midwest Federation. All their many friends extent heartiest congratulation and best wishes.

*

May we call the attention of all of our readers in the Great Northwest to the CENTRAL OREGON MINERAL SHOW to be held in the Armory at Bend, Ore., on July 4, 5, 6, 1957. This will be on the days of the "Far-Famed Mirror Pond Pageant," which is an added attraction of unusual interest. For further information contact Merle Jones, Box 412, Bend, Ore., who is general chairman. The Powell River, B.C., clan-kilted bagpipe band will be in Bend for the water pageant.

*

One of the many side attractions of the Midwest Conclave at Platteville, will be a visit to the studios and showrooms of the JOE PHETTEPLACES at Wauzeka, Wis., where the famous mosaic "Man O' War" and other works of art will be on display. Joe is a gracious host and will welcome his many old friends and new ones alike.

*

The 1957 edition of "KANSAS ROCKS AND MINERALS" is now being distributed by the State Geological Survey, University of Kansas, Lawrence, Kan. This booklet includes a section on the geologic history of Kansas; a geologic timetable and rock chart; a generalized geologic map and a cross-section of Kansas rocks; a discussion of the types of rocks found in Kansas; a detailed description of 34 Kansas minerals, and a county index as well as a general index.

Copies of "Kansas Rocks and Minerals" may be obtained from the Survey upon request for a mailing charge of 5c per copy.

*

It will be of interest to the many friends and customers of the BOISE GEM SHOP to learn, according to word received from Bert Cole, that they have moved into new modern quarters on U.S. highway 44, some five miles west of Boise. Rockhounds traveling through are always welcome. Drop by and see them on your next trip out their way.

*

Our subscription manager, WILLIAM H. ALLAWAY, of Downers Grove, Ill., is very happy these days over the fine response he is having

from so many of the Midwest societies who are loyal in their support of their official organ, EARTH SCIENCE magazine. So far we have heard from the following societies, who have all sent in substantial lists of new subscriptions: Earth Science Club of Northern Illinois; Cedar Valley Rocks and Minerals Society; Chicago Rocks and Minerals Society; Wisconsin Geological Society; Des Moines Lapidary Society; Geological Society of Racine; Rochester Earth Science Club; Cincinnati Mineral Society; St. Louis Mineral and Gem Society; Minnesota Mineral Club; Geological Society of Minnesota; Evansville Lapidary Society, and the Manhattan Mineral Club.

EARTH SCIENCE management appreciates this cooperation very much and it is hoped that every society in the Federation will soon get in line and boost their magazine subscriptions.

*

Plans for the 1957 convention of the EASTERN FEDERATION OF MINERALOGICAL AND LAPIDARY SOCIETIES are rapidly taking shape. The Gem and Mineral Society of the Virginia Peninsula will be hosts for the affair which will be held at the Hotel Chamberlin at Old Point Comfort, Va., on August 29, 30, and 31. A field trip will be held on Sunday, September 1.

A feature of the show will be an exhibit of Virginia minerals and a map of collecting areas prepared by the Virginia Polytechnic Institute. The field trip will be made to the sites nearest to Hampton. Also on exhibit will be the Hickock Company's collection of early American jewelry and related objects. During the show a Gem Queen will be selected. All participating clubs are requested to nominate a queen, who must be between the ages of 16 and 26.

Those attending the show will have the pleasure of visiting the oldest English-speaking community in America. Hampton was founded in 1609, two years after the settlement of Jamestown. The streets were originally laid out in the form of a bow and arrow. Part of the "bow," the "string" and the "arrow" are still the main thoroughfares. The city is about 35 miles from Jamestown, which this year is celebrating the 350th anniversary of its founding.

* * *

AUTHORS

In his account of Diatoms, BERNARD W. POWELL, of Glenbrook, Conn., brings into play not only knowledge of the subject but also the skill of the professional science writer that he is for presenting it with clarity. This is the second of three installments, the last of which will appear in our next issue. Illustrations are by courtesy of Johns-Manville Corp. . . . And to the writing of his account of Basic Principles of Rockology, WILLIAM H. ALLAWAY, of Downers Grove, Ill., brings the contagious enthusiasm and persuasiveness that have caused Bill to be termed the Pied Piper. . . . WILLIAM D. KELLY, of Chicago, is by profession a consulting engineer. . . . The article on ESCONI is reprinted (with slight revision) and accompanying pictures used by courtesy of *WE*, official employees' publication of Western Electric. Articles on other Midwest clubs will appear in succeeding issues. . . . E. D. CORNWELL is a chemist, with Armour & Co., Chicago.

* * *

LETTERS TO EDITOR

7417 Madison St., Forest Park, Ill.,
January 29, 1957.

A friend gave us about a dozen old issues of EARTH SCIENCE when he retired to Florida. My wife and I have never enjoyed a magazine more. We are asking for a three year subscription. If the $5.00 is not sufficient, please let us know.

Our family consists of two rockhounds and three "pups" aged 12 years, 7 years and youngest 8 months. Our youngest helped us hunt agate on Lake Superior last September at the age of 4 months. We believe in starting them early.

—K. L. WICK

*

Bucher* Such* Dienst, Zurich, Switzerland,
March 7, 1957.

Thank you for your letter of Febr. 15 and your invoice for 35 subscriptions.

Please enter one additional subscription. We made a mistake when ordering on Jan. 17th.

Therefore we enclose amount of $72.00 to cover 36 subscriptions. Please be kind enough to send one more copy of the first issues.

—PINKUS & CO.

*

Pittsburgh, Pa.

I am glad you are undertaking to print something about rocks that even a rank beginner can understand that is readable and can be absorbed. I refer to William Allaway's articles on Basic Rockology. It is better sometimes to go under the heads of a lot of your readers than over the heads of a lot of others like myself.

I read his article in the last issue of EARTH SCIENCE on the "Igneous Rocks" with much interest and shall look forward to reading the others that are to follow later.

—JOE CARTRIGHT

*

2149 N. Bell Ave., Chicago, Ill.

I would like to add to my personal data as a subscriber of EARTH SCIENCE and author of the article on "The Meteorite Shower of Pultusk" (March-April issue), that my wife and I became citizens of the United States of America as of January 29th, 1957.

—T. J. TURLEY, Geologist

* * *

LETTER FROM EDITOR

DEAR FELLOW ROCKHOUNDS:

Wherever you may live, or regardless of your Federation affiliation—or even if you belong to no club at all, let me urge you, if possible, to attend our 1957 Midwest Field Trip Conclave, at Platteville, Wis., on June 27-30—on any or all of these dates.

I have been very familiar with this area for many years, and let me assure you that there is absolutely no more interesting or worthwhile place to visit in the entire middle west. This region has long been known as the "Switzerland of America" and it is certainly deserving of the name. It holds more of scenic, historic, mineralogic, geologic and archeological interest wrapped up in one small package than any other place that I know of.

Just think of a half-day's steamboat ride on the "Father of Waters," and a "Welsh Miner's Dinner" for a banquet, all at prices so very reasonable that you can scarcely believe it—not the big prices we are so used to when going to big city conventions. Be sure and come and get in on the fun. We'll be seeing you at Platteville!

Sincerely yours,
—BEN HUR WILSON, Editor

What to Look for at the Midwest Conclave

GALENA, the principal ore of lead, is mined in the Platteville region to be visited by the Midwest Federation in June, which is a part of the famous Tri-State district of northwest Illinois (Galena), southwest Wisconin (Platteville), and northeast Iowa (Dubuque). It will be one of the chief minerals to be collected while there.

Galena is perhaps one of the easiest to identify of all minerals. It nearly always occurs as cube-shaped crystals and it has a strong tendency to break into cubic fragments when it is shattered. The mineral has a typical lead-gray color and a gray-black streak, and it has a bright metallic luster. One of the early state geologists described the fresh cleavage faces as "shining almost like a mirror." Galena is heavier than most minerals and so soft that it will make a mark on paper.

LEAD has been extracted from galena since at least 1500 B.C. The ore has been mined in the United States for more than 300 years, being first discovered in Virginia, where lead pellets, called shot, were manufactured even in pre-revolutionary days. Shotgun pellets begin their career at the top of a shot tower, where molten lead is poured into a dropping pan with a finely perforated bottom. In Washington's time the Natural Bridge of Virginia was used as the vantage point from which molten lead was poured, and the resulting pellets were picked up by hand from the stream below.

Everyone attending the Midwest Conclave should make it a point to visit the "OLD SHOT TOWER" at Dubuque, near the bank of the Mississippi, which is celebrating the one-hundredth anniversary of its building this year. A visit to the historic "Shot Tower" on the river bluff, three miles south of Spring Green, located on state route 23 northeast of Platteville, is a diversion very much worth while.

(Anyone wishing to read the complete history of the famous shot-tower at Dubuque may find it in the issue of *The Palimpsest*, monthly publication of the State Historical Society of Iowa, Iowa City, Ia., for December, 1949, pages 377-89, which may be purchased for 25c.)

SPHALERITE, the important ore of zinc, is built like a diamond and can smell like a rotten egg. One of the most common of minerals, sphalerite, or zinc ore, has been mined in the Platteville area for more than a century. This mineral is also called zinc blende, blende, black-jack, and mock lead. It is composed of zinc sulfide. When pure it is nearly colorless, but most specimens are colored brown, yellow, black or red because of impurities. The streak is white to dark brown—always much lighter than the color of the specimen.

Sphalerite crystals commonly have the shape of triangular pyramids with three sides and a base. This substance with atomic structure similar to that of diamonds has good cleavage in six directions and will break into twelve-sided blocks. It has a brilliant resinous, diamondlike, or almost metallic luster, and is harder than a penny but can be scratched by a knife.

In warm hydrochloric (muriatic) acid sphalerite breaks down and forms hydrogen sulfide, which has the well-known odor of rotten eggs, but sphalerite can be more pleasantly identified by its cleavage and resinous luster.

The zinc that is extracted from sphalerite is used in galvanizing iron, in making brass, in electric batteries, and as sheet zinc. Other metals, especially cadmium, are also often associated with sphalerite and are recovered as valuable by-products. This is particularly true in the Tri-State area of Missouri, Oklahoma and Kansas. Cadmium is used in various alloys for electroplating.

CALCITE is a mineral so common that many beginning collectors may feel that it is scarcely worth looking for. Do not be deceived, however, by its abundance, for in many respects it may be considered as one of our most interesting and important minerals, both because of its beauty, and because of its usefulness from a scientific and practical standpoint. Someone has said that the history of calcite is the history of mineralogy.

Its crystals occur in such profusion, variety and beauty as to have easily attracted the attention of early mineralogists and to have furnished them with abundant material for study. In few places may finer specimens be found than those associated with the minerals galena and sphalerite around the mines of the Platteville area. Older mine dumps are always to be looked upon as likely spots for good collecting. This area has long been known for the excellent examples

of rhombohedron and scalenohedron crystal forms found here.

One of the strangest optical properties of Calcite (variety Iceland spar), is its high angle of refraction, the highest of any common mineral. A thin plate of clear optical calcite, when properly oriented, causes one to see double—two lines appear to be seen where there is only actually one. As a polarizer of light in certain optical instruments, the "Nicol prism" is almost indispensable.

Several other varieties of the carbonate group of minerals have likewise been found in the region, and one should hang on to any specimen which appears to be a bit unusual while collecting, as it might turn out to be something uncommon, if not very rare. Greater care should be exercised in packing such crystals as are found than usual, due to their fragility and lesser hardness. A good supply of old newspapers on hand makes for excellent packing material.

IOWA'S FAMOUS EFFIGY MOUNDS. Everyone who has time should visit Iowa's EFFIGY MOUNDS NATIONAL MONUMENT, which may be reached by a drive of a few minutes north from the west end of the bridge spanning the Mississippi River from Prairie du Chien, on U.S. route 18.

(For further information secure or consult the March-April, 1956, issue of EARTH SCIENCE magazine, containing a splendid article by Florence L. Clark, page 14.)

THE PICTURED ROCKS OF MCGREGOR. In a wooded ravine among the hills overlooking the Mississippi River, one mile south of McGregor, Ia., a stratum of St. Peter sandstone is exposed which is almost pure silica. But small amounts of iron oxide have been deposited between the grains of sand by the water percolating down from the overlying Trenton limestone, and this infiltration has produced more than forty delicate shades of color in bands and patches, which give the face of the rock a beautiful variagated appearance. To the thousands of visitors the place has long been known as the "Pictured Rocks."

It was from this sandstone, wherein may be found most of the chromatic color range from pale shell pink through deep dark red, as well as green, blue, terra cotta, brown, and the achromatic colors from white to black through the intermediate grays, that Andrew Clemens, the world famous sand artist of McGregor, obtained the material for the exquisite miniatures he designed and executed in glass bottles. So great became his fame that he had received world wide aclaim as an artist before his death in 1894, and until this day the excellence of his work has never yet been approached. Only a few of these marvelous picture bottles are yet in existence, and they are considered as priceless works of art. Several may still be seen in McGregor, where they are most highly prized.

All who attend our Field Trip Convention in June, and are interested in colored sands, should bring along a set of clean screw cap bottles or jars in which to make their collection. Nowhere in America is there an opportunity to obtain such a variety of colors in a single exposure of sandstone. On the way out to the "Pictured Rocks," one may see the birthplace of the famous showmen, Ringling Brothers, and a few miles beyond lies Iowa's PIKES PEAK STATE PARK, visited early by Lieut. Pike, and the first so named. At its top, nearly 500 feet above the waters of the Mississippi, one stands on the spot of land first viewed by the white man west of the upper Mississippi River, and here he may look down on the mouth of the Wisconsin River, whence Joliet and Marquette and their party first viewed it in 1763. Effigy mounds are also present in the park.

(For those who might like to read the complete story of Andrew Clemens, who by the way was a deaf-mute, we would advise that they secure the copy of *The Palimpsest*, for May, 1945, containing a splendid article on "McGregor Sand Artist".)

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Earth Science

MAY-JUNE, 1957 Vol. 10, No. 3

Fossil Diatoms

II.

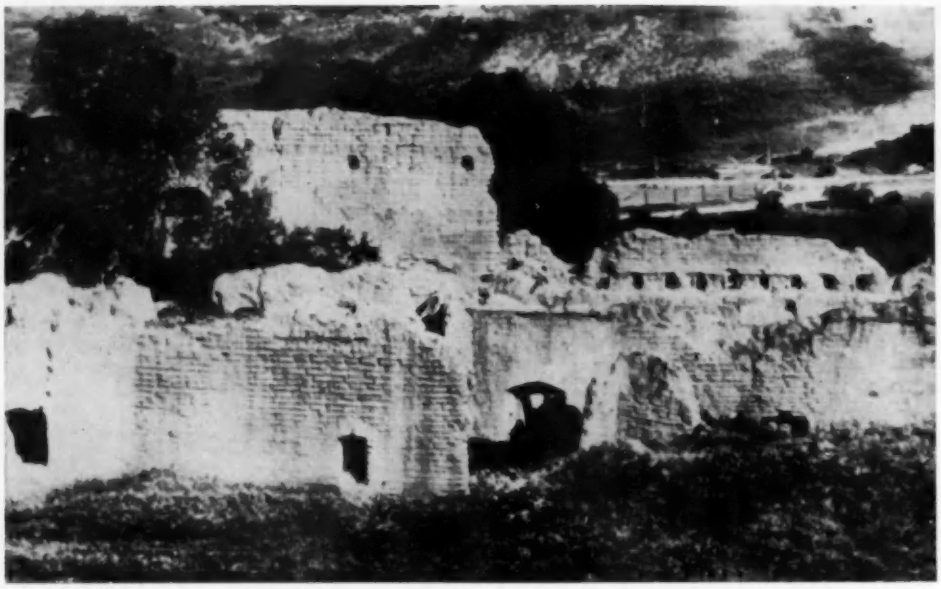
by BERNARD W. POWELL

Structure of the Diatom

DIATOMS are of two main types: marine and freshwater. Technically, their siliceous cell walls are called frustules, and the variety and form of these frustules (see illustration) have been likened to those of snowflakes—whose geometric shapes are perhaps better known. Wolle, as early as 1894, had sketched over 2,300 varieties of diatoms from North America alone. There are approximately 10,000 species known today throughout the world. The frustule is divided in half in all these forms and these halves or valves fit together somewhat in the manner of the two parts of a pillbox. Their line of union is termed the girdle. Microscopically, the girdle view differs markedly from the valve view, so that both have to be known for purposes of identification. Among the most beautiful of natural objects, all diatoms have in common the fact that they are bilaterally symmetrical and transparent to translucent. The living protoplasm is actually inside a clear, hard, glass-like little container. Most forms are floating or planktonic types but there are many bottom dwelling forms we could characterize as sessile or benthonic. Most species are composed of individuals; a few types are colonial. Their absorptive and refractive effect on transmitted light gives certain forms various green and blue shades; others are colorless. Though present almost universally in the waters of the globe, diatoms often prefer colder waters, and the oceans of the polar regions teem with untold billions of them and must also have in the past. Diatoms are called the "grass of the sea" and on them as a basis is raised the whole complex pyramid of "life-on-life" in aquatic environments. Being plants, diatoms manufacture food from inorganic materials, and become at once then, in Nature's complex scheme, the prey of animal forms. Protozoans, hydra, worms, rotifers, microcrustacea of all types consume diatoms. In turn these animals are food for larger animals: invertebrates, fish fry, tadpoles—in their stead diet for larger fish, water mammals, frogs, and so on, culminating in man when he consumes his catch of sea or lake. A naturalist once said, "All fish are diatoms."

Diatoms and Mankind

Since earliest times, mankind has used infusorial earth. Undoubtedly prehistoric men soaked highly-porous chunks of diatomite in animal and mineral oils for use as torches and lighters. One of the earliest recorded uses was in construction when the architects of the Cathedral of St. Sophia in Constantinople, around 532 A.D., lightened structure of a 107-foot dome through use of diatomaceous bricks. The low strength of the material has not permitted survival of its use in construction. Alfred Nobel in his historic experiments used diatomaceous earth as an absorbent for liquid nitroglycerin in the invention of dynamite. This use, too, has become minor. However, diatomite is still a much sought commercial material, supporting an industry that does millions of dollars worth of business annually. Today insulation materials and superior filtering aids of all types are



Now fully restored by the State of California, La Purisima mission had only one wall standing in 1933 when this picture was taken. Diatomaceous earth was used in its construction by Franciscan Fathers in the early days.

made from diatomite. The spaces between the interlocked cells of compacted fossil diatoms—plus the tiny pores in many species—provide a natural filter that would be extremely hard to duplicate artificially. During World War II, troops in North Africa and in the South Pacific owed uncontaminated drinking water to diatomite filtration. So effective is this method that it traps cysts of the dread *endamoeba histolytica,* the organism which causes amoebic dysentery. Blood flukes and schistosoma of many microbial species are also trapped by diatom filters. Thus is proved diatomite as a potable water filter. Diatomite is used as a filler in paints, in plastics, and in the manufacture of streptomycin and other antibiotics. Individual diatoms have served as inspiration to the designers of textile motifs. Exacting lenses are judged by their resolution of complex detail known to be present in some key species. After one theory, the giving up of hydrocarbon compounds by buried diatoms of long ago was the origin of the vast oil reserves beneath the California shoreline. In toothpaste, in silver polish, in packing around steam-pipes—the utilization of fossil diatoms by industry is quite extensive and beyond the scope of this article. It is sufficient that fossils out of earth's past permit many attainments we enjoy in the present.

The California Deposits

Extensive deposits of pure, white diatomaceous earth abound throughout southern California. The main beds extend from Laguna in the south to Monterey in the north. At Lompoc, in the foothills of the Sierra Santa Ynez Mountains, or the White Hills—famed diatomite deposits unequaled elsewhere on earth. These beds are of marine diatoms, but notable localities for freshwater diatoms occur not far to the north and east in Nevada, Idaho and Washington. A review of geologic events here might illuminate the formation of kieselguhr in general.

During middle and upper Miocene times, ten to fifteen million years ago, the coastline lay much farther to the east than it does today. Indeed, it lapped inland to the

site of Fresno in the central interior of the state. An archipelago of islands, protected lagoons, and bays stretched north and south through this shallow sea. There was widespread vulcanism at this time throughout much of the West and a great deal of it was submarine activity off the California coast. These volcanoes kept large quantities of silica "charged" in the waters of the lagoons and bays. Unlike many other living forms, diatoms secrete siliceous cell walls. This means they must extract silica in solution from the water. The conditions, therefore, were ideal for diatom growth and the tiny plants began to thrive in astronomical numbers.

Could we go back in time to that remote day and take along one of the modern skindiver's aqualungs, we would see a splendid sight. Adjusting our apparatus and slipping beneath the cool green of the Miocene sea we swim lazily down along the ocean floor. Here and there bright schools of fish materialize and then fade again into the sun-flecked waters. Seaweed floats gracefully upward from the bottom; whole forests of giant stalks sway in unison to the mild currents. We glide momentarily over the black and yawning cone of a submarine volcano and paddle hastily onward until we are again slipping along over the sunny bottom. Escaping gases, vented upward from the plutonic fires far below, trickle toward the surface as silvery plumes of bubbles. And everywhere the water glints and sparkles as though thousands upon thousands of tiny sequins were floating in suspension. These are the downward-drifting frustules of dying and dead diatoms. As they settle—though too small to see—they now and again catch a ray of light and like dust particles in the air, they gleam and dance. The bottom is buried in them. Our flippers raise a muddy dust as we paddle along; behind us we trace our course along the ocean bottom where the disturbed sediments hang still—suspended in veils of glittering particles.

A magic carpet of life floats everywhere near the surface of this protected area. Undulating in the currents, pulled and tugged by the tides, the carpet extends into every cove, every little bay and for miles offshore in the rolling blue waters of the ancient Pacific. The gentle motions of this "carpet" cause a perpetual rain of discarded frustules to drift slowly down through the clear waters. A blanket of diatomaceous ooze extends everywhere for hundreds of miles and with the passing of time becomes extremely thick. A hundred feet, three hundred feet, five hundred feet —the sediments grow. Cyclic fluctuations in volcanic activity, inwashing muds and silts from the eroding rivers that gnaw down the coastal highlands, combine to upset the delicate balance of compounds in the water. The ooze alternates now and again with layers of sterile mud and clay—but returns always as the diatoms reassert their dominion of the upper waters. The fossil beds continue to grow in depth. A thousand feet thick now and still the microscopic fossils drift down. Eventually the deposits exceed fourteen hundred feet in many places . . . Analogous "rains" take place under the seas of our own time. Along the continental shelves and in the geologist's "profound abysses" of the open ocean, foraminifera, radiolarians and the ubiquitous diatoms continually settle and blanket the deepest, darkest, calmest reaches of the sea.

What about those highlands to the east? What was happening throughout the regions of present-day Oregon, Washington, Nevada and Idaho? The associated vulcanism here resulted in outpourings of lava which dammed many rivers across their valleys. Lakes developed which supported vast numbers of freshwater diatoms. Ultimately, the ceaseless river activity ate through the lava dams. The lakes drained and left behind in their former basins dry and dusty deposits of diatoms.

With the closing of the Miocene, diatom growth in the waters off the California coast was sharply curtailed. Non-diatomaceous sediments poured in at increased rates and settled over the underlying fossil beds.

Thus a protective "cap" was formed over much of the deposit. Gradually, the whole region underwent marked geologic change. The ocean receded as its floor was slowly uplifted. Mountain building (orogeny) began on a grand scale. The diatomite beds became folded into the trough-like series of the well known anticlines and synclines. These newlyformed elevations underwent progressive erosion. Rivulets and washes ate back into the hills. Slides and progressive gulleying exposed the underlying diatom beds to view. Over countless years, rains percolating down through the beds produced a highly purifying and leaching effect on the diatomite. There came into being those sparkling White Hills of the Sierra Santa Ynez that beckoned Spain's conquistadores in the 16th century. Near here the Franciscan padres constructed La Purisima mission. Though now completely restored, not many years ago the mission boasted only one standing wall (see picture). In its heyday, however, when the flags of the Phillips flew from its staff and tonsured monks counted beads beneath small orange trees and the oleanders, La Purisima took its pristine beauty from the diatomaceous earths in its walls.

Many of the diatomaceous deposits along the California coast were profoundly changed by time and diastrophism into hard, dense, siliceous rocks. Fortunately, around Lompoc the diatom beds escaped these dynamic geologic forces and remained relatively unaltered down to the present time.

(To be continued)

July-August issue—III. How to Secure Fossil Diatoms, How to Prepare Specimens for Study and Display.)

Basic Principles of Rockology

II.

by WILLIAM H. ALLAWAY

WHEN GEOLOGY was an infant science there were many queer ideas about fossils. These ideas, however, have long since been greatly altered.

Upon the great flood which left Noah and his family as the sole survivors was fixed the responsibility for all the fossilized remains of marine animals found on mountain tops and other high altitudes. No other solution could be found at that early time to account for this phenomena. It must have been bad weather for rockhounding during that period!

Be this as it may, floods to some extent do have their effect upon sedimentation, as recent excavations show great layers of marine deposits which were probably laid down during times of exceedingly high waters. These sediments are sometimes found lying on top of strata containing evidence of previous civilization. Such incongruities, however, we shall not attempt to fathom here.

The Aqueous or Sedimentary Rocks

Let's take a look at some of the common sedimentary rocks and see if we can learn to identify them. Most of us, it seems, at one time or another have collected almost

"IT'S A POOR DAY FOR ROCKHUNTING"

every conceivable variety of sedimentary rocks until those who live with us have threatened to leave home if and when our basements persist in overflowing into the living room.

Before anything so drastic as this happens, however, we should attempt to classify what we have, retaining only a reference specimen of each type and then throwing out the remainder. This will have the advantage of giving us room for other rock specimens which are equally important.

Sedimentary rocks, now called the aqueous rocks, are formations of solid mineral matter occurring naturally in large quantities and usually being produced as the result of older eroded rock and soil being washed away from the bed-rock and carried down rivers and streams to the sea, where it is deposited in accordance with the laws of floatation and gravity. Naturally, the heavier rocks and the coarser gravels are the first to be deposited into the sea basin about the mouths of the rivers, forming the outer rim of the sea and the delta foundations, while the lighter particles are carried yet farther out before they gradually settle to the bottom.

Thus in studying an ancient sea bed deposit, the history of its formation can be traced and reconstructed by the size of the grains or pebbles in the sedimentary rocks and conglomerates. Other interesting observations can also be made by further study. For instance, the various seasons of the year could possibly be determined by the extremely fine grained deposits occurring during the winter months when the frozen surface of the larger lakes so quieted the waters that even the finest silt gradually sank to the bottom. On top of the fine silt layers would occur coarse gravel, telling of the melting of the ice and snow and the spring floods which washed the heavier gravel and sand down to the basin to form the succeeding layers. The nature of the ancient water body could also possibly be determined by the mineral content of the rocks.

The density of the rocks would also indicate to some degree the effect of the positive electrolitic action of the mineral particles in the water on the negative particles of the clay and silt bottom. This electrolitic attraction which causes the particles to adhere to each other constitutes the starting point of rock formation, which is of course followed by cementation and pressure of other heavy layers and water to complete the rock forming cycle.

Upon elevation above the sea, the drying out of such beds leaves accumulations of huge layers of rock which are composed in many cases of sand, lime and silt, which account for the great abundance of sandstone, limestone and siltstone present upon the earth's surface.

There are many items of geological interest associated with sedimentary rocks, such as the presence of fossils or petrified remains of former marine plants and animals in the rocks. Some of these fossils which are peculiar to a certain strata are significant to the geologist as indexes in identifying the geologic age or period of the strata.

Another interesting point is the great quantities of sedimentary rocks that have been deposited throughout geological time. It has been estimated that if the maximum depth of all the layers were combined there have been some 95 miles of sediments laid down on the surface of this earth. As you will seen then, the sedimentary rocks are the only type of the three great classes of rocks that form on top of the earth's surface. We will now examine some of the common sedimentary rocks, starting with sandstone.

SANDSTONE can be recognized by its granular structure and rough appearance, since it consists of grains of sand cemented together (usually) with silica. Some sandstone is very tightly cemented and fine grained, such as the beautifully banded type called WONDERSTONE. Others are loose grained and coarse and could be considered as case hardened by exposure to weather which cemented the outer surface sand grains together. Breaking the outer

wall causes the whole rock to crumble.

SILTSTONE is the same as sandstone only finer grained and represents sediments sorted out by water action and consolidated into a fine grained sandstone. All of the sandstones may come in almost every conceivable color. One of the most famous examples is the red beds that run through the "Garden of the Gods" and the Red-Rock Park in Colorado. This formation extends from Alaska right on down through to the tip of South America. Many of these sedimentary rocks may be recognized by the striped appearance of the rock, which was caused by layer after layer settling on the sea-bed fed by the rivers and streams.

SHALE is a cleavable rock formed by the consolidation of clay, mud or silt having a finely stratified structure, and is usually found in tubular sheets or pieces of uniform thickness. It comes in all colors but most commonly dark gray or brown and is found in old lake or river beds.

ARGILLITE, which is composed mainly of silicates, is the same as shale without the laminations (layers), and will break with a conchordial or shell-like fracture. Argillaceous (clay-like) rocks are the most abundant of all sedimentary rocks but are difficult to study due to their being fine grained.

LIMESTONE is a consolidated remnant of shells or other marine organisms, being composed of calcium carbonate precipitated from the water by these organisms to form their protective shells or coverings. As these animals die, their harder parts (shells) eventually break up and distintegrate to build up the deposits of limestone rocks (calcium carbonate) with which we are all so familiar. There are many varieties of limestone, all predominately calcium carbonate.

LITHOGRAPHIC LIMESTONE is an extremely fine-grained rock from Solenhofen, Bavaria, and was formerly used in the lithographing process.

MASSIVE DOLOMITE is a calcium-magnesium carbonate that looks a great deal like limestone and most of which is actually altered limestone, being changed by the replacement of some calcium atoms by magnesium atoms by the process of infiltration. It does occur naturally in a primary form on occasion, under proper circumstances. It is somewhat harder and denser than true limestone or calcite and will not effervesce (fizz) when treated to cold dilute hydrochloric acid. It sometimes forms beautiful little rhombohedral crystals, white or pink, and usually with slightly curved faces.

Both limestone and dolomite are light tan to dark gray in color. They are used extensively as aggregate in making concrete, roadbeds, and for buildings.

Other form of limestone are: (a) CHALK which is very fine grained, since it is composed almost wholly of shells of very minute sea organisms called foraminifera; extensive beds of this material are found in Kansas; (b) OÖLITIC LIMESTONE formed of tiny spherical concretion; (c) TRAVERTINE, a limestone sometimes called cave-onyx, which is formed by overflowing springs. It is used extensively for making lamps, bookends, etc., because it is easy to work with, is often beautifully banded, and takes a fine polish. The color is from light tan to a very dark brown; (d) GEYSERITE is formed around hot springs from evaporation of the calcium laden water and by the action of algae which secrete it from the water, is white in color, very porous, and light in weight. Still others are ALGAE LIMESTONE, CORALLINE LIMESTONE, CRINOIDAL LIMESTONE, BRACHIAPODAL LIMESTONE and FOROMINIFERAL LIMESTONE, the great abundance of fossil organisms being the criterion that names the stone.

CONGLOMERATES are round fragments of stone cemented together naturally with silica or calcareous cement, and are distinguished from BRECCIA, with angular fragments cemented in like manner.

Among the numerous unconsolidated sediments are gravel, sand, silt, clay, marl, glacial till loess, and diatomaceous earth, most of which may already be familiar to the reader. When glacial till becomes con-

solidated it is called TILLITE. Marl is a mixture of clay and calcite and contains many shell fragments. Loess is a wind deposited sediment. Related to and associated with sedimentary rocks is a great family of rocks known as the QUARTZ family, that occur as a result of precipitation of silica contained in percolating ground waters. These rocks form in many different varieties depending on the variable conditions and minerals present in the parent rock.

CHERT is a precipitated silica ranging from tiny granular quartz to CHALCEDONY and OPAL, and occurs in all colors. FLINT is a tough variety of chert colored by iron oxides and is now used extensively as semi-precious gem stones in jewelry. It was also the principal material from which the Indians made arrows, spears, etc. NOVACULITE is a white variety of chert and is so smooth in texture that it is used extensively for making whetstones.

With this we will close our present discussion of the sedimentary or aqueous rock system. Some of these subjects will be treated farther in our next article upon the metamorphic or altered rocks.

A Club Is Born—"Hawthorne's Rockhounds"

ROCKS WAS THE SUBJECT that brought four Hawthorne men, two of their neighbors, and six of their sons together in Bill Allaway's living room in Downers Grove, Ill., the night of December 12, 1949. They were still talking rocks when the host nudged them firmly into the snowy street at five o'clock in the morning.

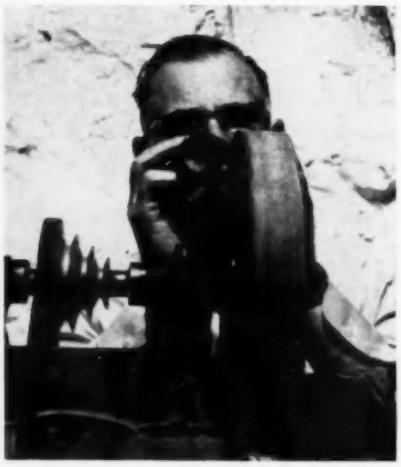
When 30 people arrived for the second session, Bill and his colleagues from the Hawthorne Works of the Western Electric Co., at Cicero, Ill.—Roy Beghtol, Harry Thayer and Steve Norvell, scheduled the Congregational Church basement for the next one. But the rock-hungry talkers multiplied like guinea pigs—from 60 to 120 to 200 on consecutive meeting nights, and by their fifth meeting the local high school auditorium had become the permanent home of an organization which now had a name—ESCONI, the Earth Science Club of Northern Illinois.

Its members — today numbering 420, their wives and their children collect, sort, trade, study, classify, cut and polish rocks. They spend their weekends in gravel pits and in primeval coal forests searching for new specimens, their week nights poring over literature to identify their finds, their vacations roaming any area from the Black Hills to the Rockies that promises undiscovered and interesting deposits of rocks, minerals and fossils. Not the least of their interests is in archeological finds (Indian relics), and they have done much valuable research in the area of earth science.

Their basements are filled with rock collections which sometimes overflow into the garage while the family car stands out in the driveway. Even their living rooms are not beyond encroachment. They proudly call themselves "rockhounds" and their children "pebble-pups." Their enthusiasm is as epidemic as a 14th century plague. Rockhounditis is really very contageous, it seems.

In the eight short years since the meeting at the Allaway home ESCONI has beanstalked into one of the largest and most active clubs in the entire country—certainly the most departmentized. The members have regular functioning sections in geology, paleontology, paleobotany, mineralogy, archeology and the lapidary arts, with a special study section on astronomy. They have four active junior groups, conduct a mineralogy class at the Hawthorne evening school and another at the Downers Grove adult education school. They have exhibited at schools, libraries, museums and

Skull of oreodont, one of first mammals, and 60-million-year-old turtle are displayed by "Doc" Hoff, who has been rock-hunter for more than 20 years.



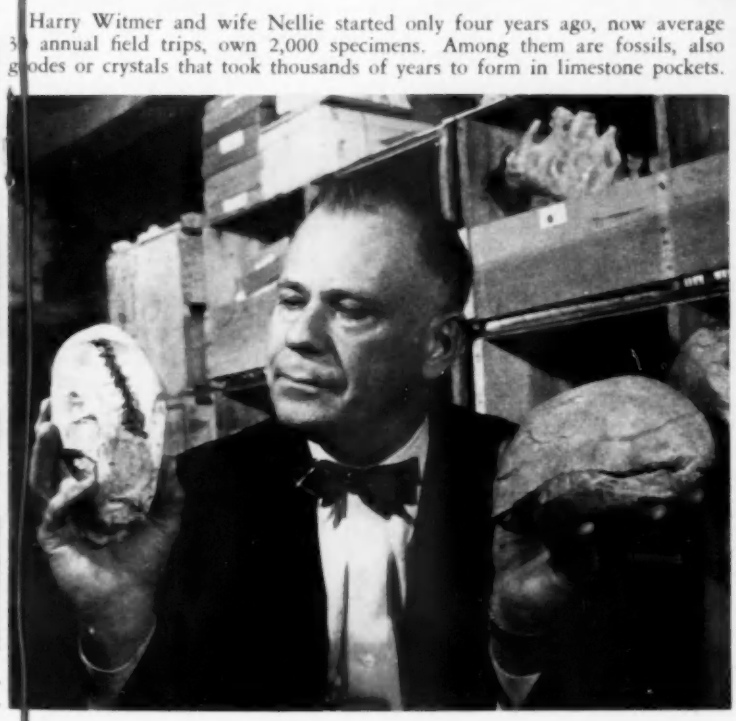
Cutting and polishing equipment vies for space in Wilbur Hoff's cellar with one of midwest's finest general collections.

*

W.E. members of what is now one of largest, most active earth science clubs pose for snapshot *(right)* between forages for rocks on summer field trip. They are: Orval Fether, Bill Allaway, a club founder, and William Elliott. ESCONI interests lie in six scientific fields.

After taking up rocks because his son was interested, Roy Beghtol became avid collector himself; so did wife. Their basement collection has lab for chemical analysis of minerals; son is now studying geology in university.

Harry Witmer and wife Nellie started only four years ago, now average 3[illegible] annual field trips, own 2,000 specimens. Among them are fossils, also g[illegible]odes or crystals that took thousands of years to form in limestone pockets.



Prize find at "Thornton dig" was bony Chicagoan. Notations mark excavation for records. Indian artifacts hundreds of years old were dug up by archeology project on which many Hawthorne amateur scientists worked.

did wife.
niversity.

pioneer events, and their display at the annual midwestern convention of earth scientists took first prize last year.

A group of its members sponsor and publish EARTH SCIENCE, the Rockhound's National Magazine, and the American Geological Institute in Washington has pointed to their club as a pattern for others to follow. Greatest period of growth was under the regime of Carl Hoffman, Western Electric employee, the rockhounds' third president, credited with reorganizing and stabilizing ESCONI into the dynamic club it is today.

Probably its greatest local contribution to the earth sciences, however, was what in archeological circles is now known as the "Thornton dig." When the Chicago Museum of Natural History heard several years ago that a super-highway was to pass through a forest area near Chicago where many Indian artifacts had been found, ESCONI answered a call for volunteers who would work with the museum staff to excavate before it was destroyed.

For the next ten weekends, in hot, miserable weather and without compensation, these amateur archeologists dug—moving 100 tons of dirt and sand as carefully as a housewife would dust a Ming vase. Using hand trowels, small picks, and often spoons, needles and paint-brushes, they peeled the earth away, six inches at a time. All objects found in each square were carefully sacked and tagged to facilitate the several years of study ahead for the museum staff.

But the Hawthorne earth scientist's first love is rocks. Many club members' collections boast thousands of specimens. In fact, when one Western Electric man transferred from Hawthorne to Tonawanda, N. Y., nine tons of rock accompanied his household effects.

Despite the satisfactions of collecting, the earth sciences appeal to something basic in man: his desire to learn more about the earth itself and the creatures that preceded him as its inhabitants. (Let the skeptic look into his bureau drawer for the pebble he unaccountably brought back from the beach or mountains last summer). More than that, clubs like ESCONI are making a substantial contribution to man's knowledge, not only by the "finds" of their members but also by fostering interest among young people—some of whom, like Roy Beghtol's son Leroy, now a geologist, may go on to make one of the earth sciences their life work.

(Read "Earth Science Emphasis Week," in the July, 1952, issue of EARTH SCIENCE.)

Students Cut Diamonds, Not Classes, Here

THEY'RE sawing and filing up thousands of dollars worth of diamonds at Illinois Institute of Technology, Chicago. However, they are not being destructive, the work is being done in the nation's first course in the preparation and use of diamonds as industrial tools.

The one semester course is part of the educational program on shaped diamond technology established in 1956 at I.I.T. by Industrial Distributors, Ltd., Diamond Research Laboratory, of Johannesburg, South Africa.

It covers selection of diamonds for various uses, sawing and shaping diamonds for tools, and turning, boring, and wheel dressing, according to Dr. Frank D. Carvin, director of the Institute's mechanical engineering department.

Most of the students are toolroom technicians, toolmakers and designers, and industrial specialists, reported Samuel E. Rusinoff, professor of mechanical engineering, who is in charge of the course.

The 15 week course includes three hours of lectures and three hours of laboratory instruction in the school's new shaped diamond tool technology laboratory, which has about $40,000 worth of diamond working tools. Most of the instructional tools

are foreign made.

"The laboratory," said Dr. Carvin, "was assembled under a $30,000 grant from the South African organization. Diamonds have been used for industrial purposes for many years, but their importance in modern mass production manufacturing methods was not fully appreciated until World War II.

"During that period," he continued, "The extreme hardness and abrasion resistant properties of the diamond and the relation of these properties to modern industrial requirements were fully exploited."

—*Chicago Tribune* Press Service

Leo L. Coombs of Park Forest, Ill., forms precision radius tip on tool which he holds against diamond impregnated wheel.

H. C. Miller (standing), course instructor, shows Frank J. Mrok, 1718 W. 92nd St., Chicago, how to polish industrial diamond in tool he holds. Gem is polished on diamond impregnated wheel controlled by device at right.

Life, Time and Fossils

by WILLIAM D. KELLY

There rolls the deep where grew the tree,
O Earth what changes hast thou seen!
There where the long street roars, hath been
The stillness of the central sea.

—*Tennyson*

A YOUNG FELLOW I know became interested in the earth sciences and went on several field trips with a certain club of rockhounds. His mother asked him what he had learned. He said, "A few months ago, I did not even know how to spell 'paleontologist,' and now I am one."

You too can be a paleontologist.

Paleontology is the study and interpretation of evidence pertaining to life as related to time and disclosed by fossils. There is nothing there to scare us except the name, so I will repeat. Paleontology is the study and interpretation of evidence pertaining to life as related to time and disclosed by fossils.

The study of paleontology is a good way to stay young. It bends the back and flexes the knees. As you come to know the wonderful animals and plants of long ago a common bond develops. First thing you know you are dropping the years behind,

not by ones and twos but by the millions. Your horizons will be widened and you will be impressed with the knowledge you have gained. As you progress further you will gradually become aware of the vast amount of evidence still to be explored. So you will revert to your own dear modest self again. No condition of circumstances can deprive you of the knowledge you have gained, or the animals, plants and people you have learned to know in the process.

We have a geochronological chart portending Earth time of eras, periods and formations in proportion to years, the recent time period we are all familiar with. This graphic progression of years shows the advance and acceleration of evolution.

You will want to know how old the Earth is in years. So do I, but we won't point to a spot 37 feet down on such a chart and say—The Earth was born here. It did not happen this way. We do not know all the answers.

You say the Earth is 10 billion years old; all right, have it your way. We will then have to divide the age of the Earth by 350 quadrillion, 400 trillion to arrive at the 15 minute period alloted to tell you all about it. You will notice that the chart is open at both ends—that means time is infinite and that a life time of 10 billion years is just the Earth's little moment in eternity.

Any attempted reconstruction of the past in condensed form necessitates a rigid presentation of the evidence. Limitations of space and time prevent the qualifying terms that denote broad consideration of expanding knowledge as new evidence is studied.

The sea has washed over much of midwestern United States in at least eight major invasions or submersions during the past billion years. These invasions of the sea include countless advances and retreats in local areas.

Geologists do not agree on the precise cause of the periodic flooding, but many details concerning its frequency, extent, duration and associated climate have been explained by analysis of the sediments laid down in the water and fossils contained in the sedimentaries. It is written in the rocks.

In general, each major period of flooding was followed by an interval of crustal unrest during which the Earth was disturbed by volcanic action and mountain building accompanied by the accumulation of glacial ice on the land. In the period of upheaval, the midwest stood above the sea level. Gradually the crust settled down, erosion rounded off the mountains, the glacial belt retreated to the north and eventually the planed-down midwest area fell below the sea level again; then for millions of years life teemed in the balmy climate. So, each of these cyclic periods in the history of our continent is marked in the rocks by the fossil remains of plants and animals which rose to dominance and flourished for a time. Geological and climatic changes had their effect on the evolution of the life forms that remained adaptable to change and competition. The forces of nature swing, but always tend to come to balance.

Extraordinary conditions prevail in order to form a fossil record. The life forms undergo replacement by solutions that precipitate calcium carbonate, calcium aluminum silicate, magnesium carbonate, silicon dioxide, iron sulphate, iron sulphide or combinations of these minerals.

Man, stripped of his emotions, would no longer be man. We, therefore, credit these remnants and impressions we call fossils as possessing in life the response to stimuli common to all living things. They were more than the cells, colonies, structures and organisms; they were alive. Even the simplest forms of life were capable of reproduction, seeking and absorbing nourishment, adapting to environment and perpetuating strains and species.

Then there were the deviators that ventured from the norm to create new species. There would be but one form of life without the radicals. The new species proved adaptable to environment and multiplied or perished and were eliminated. These laws of nature are in force today and should be known to *homo sapiens*.

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Present knowledge indicates colloidal aggregates were energized by radiation and developed into the simplest living cells of protoplasm. From this, animals in the form of one-celled protozoa or amoeba, and plants in the form of one-celled green algae with the property of photo-synthesis came into being and are with us today in great variety and profusion.

The process of evolution was exceedingly slow in the Archaeozoic era. The quantity, the mass of life forms were enormous by the time life had reached the colonial stage in algae in the vegetable kingdom and protozoa (amoeba) in the animal kingdom. Consider a fossil specimen of colonial algae from the Laurentian period, and a fossil specimen of coal (now graphite) from the Huronian period. This was long before the Carboniferous periods of the Palaezoic, and the source of these carbons is believed to be algae colony. Some of the deep oil pools may have originated from this same source and are now the fossil fuels we are using and exhausting at a tremendous rate.

There were stages of development that we can note. There were also long periods of transition between these stages.

We recognize a stage where life reached a cellular form of single cells that split and formed new individuals. Then a colonial aggregation of cells.

In the next stage, groups of cells formed a structure and some groups became specialized. By this method rudimentary organs developed and we have phyla and species of organisms.

Photosynthesis, the process by which carbohydrates are formed from carbon dioxide and water, under the influence of light provided nourishment. The animal strains developed motion by means of contraction and relaxation within the cells. Colonies of cells provided rudimentary muscular systems, circulatory systems, digestive systems and motion in and through the waters.

The animals lost the power of photosynthesis and became parasites, dependent upon the plants for nourishment as they are directly or indirectly today. Nerve systems with centralized control developed into rudimentary heads. The sense organs developed and mouths and eyes appeared. Sex organs came to make organisms more complex, and specialized.

These marvelous developments take us up through the Archaeozoic and Proterozoic eras for 1· and ½ billion years, with another ½ billion years to go before we reach *homo sapiens* of today. We enter the Paleozoic with a multitude of life forms that still dwelt in the warm coral seas. Algae and sea weeds of many forms. Trilobites, star fish, crinoids, molluscs, worms, coral and then the vertebrates appear as primitive fish.

The evolutionary stages of development are marked on a chart. This does not mean that trilobites, for instance, were suddenly created at this moment. What it does mean is—trilobites were prominent at this period. The prototypes of the phylum reach backward into time and records are obscure. The further evolution of species continues in some cases to the present. The last of the trilobites passed from the records in the Permian with many other sea dwellers. Some related species such as the horseshoe crabs are with us today.

Now there is the sum of all this great process of evolution so briefly touched in this geochronology. The sum of this heritage is a mammal that now briefly dominates his little speck of time. Black, white, brown, yellow, but all one species *homo sapiens* must again pass, stage by stage, through this miracle of development from single cells, to genes, to sperm and ova, to embryo, to fetus, to infant, to child, to juvenile, to adult man. Two billion years of evolution encompassed in twenty years.

More About Lead (see page 6)

Incidentally, another Tri-State area located in southeast Kansas, southwest Missouri and northeast Oklahoma, known as the Joplin area, is of equal importance. Here lead was known to exist and was mined by unknown persons, perhaps Indians, as early as 1866. This area is especially rich in minerals and is worthy of a call by all who are passing through that way.

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Flowers of the Mineral Kingdom

II.

by E. D. CORNWELL

TOURMALINE is a complex silicate of boron and aluminum. Its most common occurrence is in granite pegmatites. The gem varieties appear in several colors, such as red or pink, dark blue, and emerald green. The green variety is most common. As a result of its variety of colors, it is commonly used to match missing stones. It has been found in the U.S. in Maine, Massachusetts, Connecticut and California.

TURQUOISE is a mineral of secondary origin, usually found in the form of small veins and stringers traversing more or less decomposed volcanic rocks. It appears in various shades of green and blue, the latter being considered the more desirable. The most famous deposits are in Persia. In the United States it has been found near Santa Fe, also in Arizona, Nevada, and California.

ZIRCON of gem quality has been found in many colors; the yellow, red, and brown varieties being known as hyacinth while most of the other colors are known as jargon. The blue color of many zircons was produced by heat. The high index of refraction gives zircon a luster and fire that occasionally compares favorably with the diamond.

QUARTZ of many varieties is used as gems, most of which are relatively inexpensive. The most common coarsely crystalline varieties are:

a—Rock crystal which is clear and colorless.
b—Amethyst, a purple or violet variety.
c—Smoky quartz, dark brown to black.
d—Rose quartz, pale to deep rose-pink.
e—Citrine, yellow to yellow-brown, resembling gem topaz in color.
f—Rutilated quartz, containing fine needle-like crystals of rutile.
g—Adventurine, quartz including brilliant scales of hematite or mica.
h—Common cryptocrystalline varieties include chalcedony, bloodstone, agate and onyx which is like agate but with plane and parallel colored layers.

SPINEL of gem quality is found in several colors—red, pink, yellow, purple, and blue. The deep red variety, ruby spinel, is the most important. Most of the gem spinel comes from Ceylon, Burma, and Siam. SYNTHETIC SPINEL is indistinguishable from the natural stones, except by the experts. Star-Spinels are the most rare of "star-gems." The inclusions producing star-spinels are primarily magnesium.

Several GARNETS of different compositions are used as gems. The red prope and alamandite are most commonly cut, but are so abundant that their value is small. The green andradite known as demantoid has a high dispersion which gives the stone a striking and beautiful appearance. They are found only in the Ural Mountains and in Hungary.

The olive-green gem of OLIVENE is known as peridot. Most of it comes from St. John's Island in the Red Sea, although small amounts have been found in surface gravels in Arizona and New Mexico.

Two transparent gem varieties of SPODUMENE are known, namely, kunzite and hiddenite. The former is pink to lilac in color while the latter is an emerald-green. The former has been found in Pala, Calif., the latter in North Carolina.

The last variety of a gem to be mentioned here does not actually come under the heading of minerals, since it is not of natural origin, namely, the PEARL. They have the same composition and structure as mother-of-pearl, consisting of concentric coatings from the center to the outer surface. As a result, pearls showing a small dark center under a microscope always fall in the class of natural pearls.

The SYNTHETIC or CULTURED PEARLS, under such microscopic examination, reveal a structure somewhat similar to that of an orange, the peeling representing a coating over a synthetic center. These centers are commonly cut and prepared from shells of clams from the Mississippi River, since the layer of mother-of-pearl is thicker in these shells than in any other.

Although it is commonly said that a pearl is built upon a grain of sand, this has never been proven. This theory is quite unlikely since oysters producing pearls do not commonly live in close proximity to sand. A more likely theory is that they are formed under conditions similar to those under which gallstones are formed.

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Titanium is the ninth most common element, being almost as available as aluminum. In finished form it resists corrosion by air, salt spray, and nitric and chlorine derivates. It was discovered in 1790, but the first commercial sponge production came in 1949.

The country's top six aircraft manufacturers have informed the Air Force that titanium is the "only" metal which can do the jobs required in the next families of air weapons.

GERMANIUM

What makes Dick Tracy's two-way wrist radio a reality?

Germanium, a highly lustrous gray-white metal that has attained economic importance in recent years, is the answer.

In today's electronics industry—radio, television and radar, wide use is made of germanium in transistors and diodes, which have replaced standard vacuum radio tubes in many electrical instruments. The transistors and diodes do the same jobs that radio tubes can do, as well as others that the tubes cannot do, and they take much less space.

In years to come, germanium may be used as an alloy with gold for jewelry and dental fillings. It may also be utilized in optical glass for wide-angle camera lenses.

Production of germanium in the United States is limited to the Tri-State zinc-lead deposits of Missouri, Kansas and Oklahoma, where the Eagle Picher Co. has been extracting the rare metal from zinc concentrates since 1942. In the Tri-State area, germanium is present in sphalerite, or zinc blende, the principal ore of zinc, in amounts ranging from traces to a few tenths of one per cent. It is actually substituted for some of the zinc atoms in the atomic framework of sphalerite. Commercial zinc concentrates average from 0.01 to 0.015 per cent germanium.

Coal also contains minor amounts of germanium and is a good possible source of this important metal in the future. Work by the Industrial Minerals and Geochemistry Division of the State Geological Survey, University of Kansas, indicates that germanium is present in Kansas coal in amounts that exceed those in most other domestic coal.

WHERE ARE THE OLDEST ROCKS? While the age of the Earth has been variously estimated, by measuring the rate of disintegration of certain radio-active elements existing in the rocks of Earth's outer shell, to be somewhere between three and four billions of years, on account of vast changes that are ever occurring on the Earth, known as the rock cycles, it is not believed that any of the original rocks of the Earth can now be seen anywhere upon its surface.

The oldest known rocks which are exposed today are located in southeastern Manitoba, Canada; in southeast Africa; in Sweden, and in northern Kareila in Soviet Russia. These are all at least two billion years old. At Keystone, in South Dakota, are found the oldest rocks which are exposed in the United States, which are believed to be some one and a half billion years old. These are to be found in the granites of the Harney Peak range.

Midwest Club News

BERNICE WIENRANK, *Club Editor*
4717 North Winthrop Avenue
Chicago 40, Illinois

CINCINNATI MINERAL SOCIETY on March 27 heard Richard Durrell, associate professor of geology and geography at the University of Cincinnati, present an illustrated lecture entitled "Making Minerals by Fire." Prof. Durrell, who spent last summer studying the volcanos and geology of the Oahu, Molakai, and Maui Islands of the Hawaiian Islands group, after discussing the geology of the Islands, displayed a number of mineral specimens to illustrate the nature of lavas and the results of magmatic differentiation. He presented several theories to explain the variation in mineral composition of lavas from the same volcano. His talk was richly embellished with beautiful kodachrome pictures that he and his wife had taken of the Islands and was climaxed by the showing of a colored movie of the eruption of Mauna Loa. This film, produced by the Hawaiian Natural History Association, included some vivid closeup views of the molten lava.

On March 31, thirty members of CMS went on a field trip to a gold-bearing sand locality several miles from Milford, Ohio. Everyone found color and enjoyed the experience of panning for gold. The gravel and sands were brought down to this area by the outwash of the Illinoian glacier. The black sand consists of ilemite, magnitite and garnet. For details on this locality refer to *Rocks and Minerals* magazine, Vol. 13, No. 9, "Collecting Minerals in Southwestern Ohio," by Herman Wuestner.

*

WISCONSIN GEOLOGICAL SOCIETY on March 11 viewed an excellent color film, "Our Mr. Sun." This film presents the known scientific facts about the sun and the role it plays in life on earth.

*

MIAMI VALLEY MINERAL AND GEM CLUB is considering making a gem stone map of the state of Ohio. Tentative plans are that each county be made from a stone collected in that county (there are 88 counties in Ohio). What a wonderful reference map this would make for gem and mineral collectors!

*

SHAWNEE GEOLOGY AND ROCKHOUND CLUB on March 3 made an afternoon tour of Lindley Hall, Lawerence, Kan. This hall is the pride of Kansas University's geology department. The tour was led by Dr. Mark Jewett, of the Kansas State Geological Survey.

The group is currently outlining plans for

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*

CENTRAL IOWA MINERAL SOCIETY on April 5 viewed "The Petrified River," a colored movie of the story of uranium. This film is rated as one of the best of its kind, and was shown through the courtesy of the Union Carbide and Carbon Corp. Member Irene Ullius, who made arrangements for the film, presented each member present with a copy of "The Petrified River," a booklet relating the story uranium and atomic energy.

*

GEOLOGICAL SOCIETY OF MINNESOTA is making plans for a field trip to south central Colorado and northern New Mexico, June 15-30. The trip, which will be made in a 41-passenger, air-conditioned bus, will cover about 3,200 miles. It is estimated that the cost per person for transportation and lodging will be about $100.

The tour will be led by past president Hal McWethy, who is familiar with most of the proposed routes and who plans with Mrs. McWethy to scout the region during April and secure permission to visit various mines along the route.

*

EARTH SCIENCE CLUB OF NORTHERN ILLINOIS at a meeting of its junior members, attended by 35 juniors and 24 adults, on March 9 heard Isabel Wasson, of River Forest, speak on "The Geology of the Chicago Region." Mrs. Wasson told how the Chicago area was altered by glacial action some 15,000 years ago. Lake Chicago, which encompassed an area somewhat larger than the present Lake Michigan, was formed, and part of its old shore line can be easily observed in the vicinity of the Village Market of LaGrange Park. In the area of Lake Bluff the shore was undercut by wind and weather so that the present bluffs were formed as the lake receded. The sand that was removed was deposited in a series of spits, or raised land formations. Since these spits were on higher ground, it was natural that they became the sites of the first roads and settlements around Chicago. A few of the roads so located are Longcommon Rd., Des Plaines Ave., Milwaukee Ave., and the Glenwood-Dyer Rd.

OTHER SOCIETIES

MICHIGAN MINERALOGICAL SOCIETY on March 11 enjoyed a composite program. Dr. Daniel McGenty gave an excellent resume of "Minerals in Medicine;" Jerry Hudechek spoke on "Crystal Growing," and exhibited home-grown copper sulfate crystals; and, completing the program, a U.S. Lake Survey on map-making was shown.

*

HANCOCK GEOLOGICAL SOCIETY recently viewed slides of flints, arrow heads and other Indian artifacts of Ohio. As soon as weather permits the club plans to make a series of field trips.

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QUARTZ CRYSTALS. Unusual specimens from several localities. Odd twinning and other features. Reasonable prices. On approval. CLAUDE H. SMITH, Box 291, Geneva, New York.

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MINNESOTA MINERAL CLUB will make a field trip, via bus, to South Dakota, June 19-23. The tour will cover the best the Bad Lands and the Black Hills have to offer and arrangements have been made to hunt in many promising areas. Reservations for food and lodging have been made and at least one menu includes buffalo steak.

*

FLINT ROCK AND GEM CLUB on April 11 heard Mr. Beaumont of the Beaumont House of Agate, speak on "Gem Cutting." Afterwards Mr. Beaumont gave a demonstration of cabochon cutting and answered questions on lapidary.

*

ISHPEMING ROCK AND MINERAL CLUB reports that several of its members have helped organize a 4-H mineral club, the 4-H Jaspilites. Both the new junior club and IR&MC are currently displaying rocks and minerals in the windows of the Greater Ishpeming Chamber of Commerce offices.

*

CENTRAL ILLINOIS ROCKHOUNDS on March 30, 31, held its fifth annual exhibit of gemstones, jewelry, mineral specimens, slabs, Indian relics, sea shells and lapidary equipment. The show received wide publicity and a large attendance.

*

MINERALOGICAL SOCIETY OF PENNSYLVANIA recently showed 175 colored slides of the activities of its members during 1956. They included visits to quarries, museums, conventions, and Western trips.

*

MIAMI MINERALOGICAL AND LAPIDARY GUILD has started its third free ten-week class in rocks and minerals, for juniors. Lectures, laboratory demonstrations, movies and field trips are all part of the course. Boy and Girl Scouts who satisfactorily complete this course are eligible for their Merit and Proficiency Badges in Rocks and Minerals.

*

GEM CUTTERS GUILD OF BALTIMORE on February 12 heard Charles Ostrander, associate curator of the Natural History Society of Maryland and co-author of "Minerals of Maryland," speak on "Maryland Minerals and Mineral Locations." His talk provided the group with many leads for future field trips.

*

WICHITA GEM AND MINERAL SOCIETY on March 24 was shown 50 beautiful color transparencies of the micromount collection of Arthur Flagg, of Phoenix. When projected, the magnification of the micromounts was from several thousand to several hundred thousand diameters, and demonstrated quite well the near perfection of the smallest mineral crystals. Mr. Flagg, who is a past president of the American Mineralogical Society and is now curator of the State Mineral Resources Museum at Phoenix, has been a leader in the micromount speciality and has assembled one of the finest collections in the country, including many rarities. Slides of his collection have been shown at many Federation and local shows.

*

VERDUGO HILLS GEM AND MINERAL SOCIETY'S latest club project is making Brobdingnagian-sized jewelry. The jewelry, which the club calls "Jupiter's Jewelry" (for only an Olympic god could wear such large jewels), includes rings, earrings, brooches, cuff links and tie pins. Cabochons for the pieces are as large as nine inches long. This jewelry will be displayed at the California Federation Show, which will be held at Compton, Calif., July 5-7.

*

MIAMI MINERAL AND GEM SOCIETY'S stonecutting exhibit and display of 500 minerals and gems from all over the world was named by Miami Beach's recreation director, Jack Woody, as the most outstanding exhibit at the Miami Beach Hobby Show, March 10-12. Mr. Woody was so pleased by the display that he informed the club that it could have its choice of location and as much space as it desired at all future Miami Beach hobby shows.

RECOMMENDED READING

"A Brief History of Geology," by Norman G. Flaigg, March-April issue of *Sooner Rockologist*. An excellent condensation of the history of geology covering Greek, Roman and Renaissance times. In later issues Mr. Flaigg will deal with "Modern Geology," and "Geology in America."

*

"Indians and Flint Ridge, Ohio," by Sam Wilt, January issue of *Chip and Lick*. So important for artifacts was the flint obtained from Flint Ridge, Ohio, that the Indians declared a truce among Indian nations at this site and all tribes came to the ridge in peace and mined side by side.

*

"A Few Thoughts on the Legends and Superstitions of Gem Stones," by Gene Belz, March issue of *Keystone Newsletter*. Mrs. Belz states that the romance of gems has been destroyed by the cold eye of science, which by its tests, x-rays, microscopes, etc., has disspelled most of the legends and old superstitions about gems.

*

(A mimeographed address list of publications will be furnished on request by the Club Editor.)

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